
1 INTRODUCTION

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1 CHAPTER ONE: INTRODUCTION

Quality Control/Quality Assurance (QC/QA) is often used synonymously with the term Quality Assurance (QA). AASHTO defines Quality Assurance as "All those planned and systematic actions necessary to provide confidence that a product will perform satisfactorily in service." This definition considers QA to be an all encompassing concept which includes quality control (QC), acceptance, and independent assurance (IA).

A better understanding of the QC/QA concept can be made if the characteristics of the specifications are considered. These include:

1. QC/QA recognizes the variation in materials and test methods.
2. QC/QA uses a statistical basis that is applied and modified with experience and sound engineering judgement.
3. QC/QA places the primary responsibility on the Contractor for production control.
4. QC/QA makes a clear delineation between process control and acceptance testing.

The advantages of this type of specification include the proper allocation of responsibility for quality between the Contractor and INDOT, more complete records, and statistically based acceptance decisions. The Contractor has a greater choice of materials, and can design the most economical mixtures to meet specifications. Finally, there is a lot-by-lot acceptance so that the Contractor knows if his operations are producing an acceptable product.

The Quality Assurance Training Program is designed for both INDOT and Contractor's personnel. Although the responsibilities of the certified technician may or may not apply to both, the information presented in this training course is valuable in understanding the production of quality Hot Mix Asphalt (HMA).

CERTIFIED TECHNICIAN PROGRAM

The certified technician is the cornerstone of the Quality Assurance Program. Without a certified technician determining the quality and consistency of the HMA being produced, pavement performance problems are certain. This fundamental shift of quality control from INDOT to the Contractor is important because it places control of the plant in the hands of the Contractor.

It is the responsibility of the certified technician to test the quality and consistency of the HMA being produced. His job however does not stop at this point. The certified technician must also ensure that the HMA maintains this consistency by monitoring the proportioning of aggregates and binder by the plant. Finally, and most important, the certified technician must know what action to take when the materials deviate from specifications.

SAFETY

Safety is the business of everyone on the job. The certified technician may be working with hazardous materials and should be alert to proper precautions. This involves having the proper protective equipment, and ventilation system in the working place. Knowledge of the proper use of hazardous materials is essential to a safe working environment.

TERMINOLOGY

It is surprising to note that one paving material can be called by so many different names. HMA has numerous synonyms. It has been called bituminous paving mix(ture), bituminous concrete, bituminous mix(ture), asphalt paving mix(ture), asphalt mix(ture), asphaltic concrete or plain "asphalt", among other terms. This manual will use the term "hot mix asphalt" to help standardize the wording and minimize confusion. When the Standard Specifications are referenced in the manual, QC/QA HMA will be used for mixtures in accordance with Section **401** and HMA will be used for mixtures in accordance with Section **402**.

Asphalt materials include Performance Graded (PG) Asphalt Binders, Asphalt Emulsions, Cutback Asphalt, Utility Asphalt, and Asphalt used for coating corrugated metal pipe. HMA used for Quality Assurance requires PG binders to be used for the asphalt material. This manual will use the term "binder" when referring to this material.

TECHNICIAN RESPONSIBILITIES

QC/QA specifications for HMA require that the mixture be supplied by a Certified Hot Mix Asphalt Producer. The technician responsibilities specified in this plant certification program include:

1. Sampling HMA at the plant or from the pavement. This involves the procedures for taking representative samples and splitting and quartering for size reduction.
2. Testing HMA for binder content, gradation, coarse aggregate angularity, if applicable, and moisture content.
3. Determining and verifying mixture properties such as Air Voids, and VMA on HMA compacted by the Gyratory compactor.
4. Monitoring proportioning of binder and aggregates into the plant.
5. Correcting deviations from specifications by adjustment in proportioning.

Beyond the specific responsibilities listed above, the certified technician will be given a working knowledge of the materials used in HMA, HMA plants, and mix designs. This information, although not all required to comply with the Quality Control requirements of the Certified Hot Mix Asphalt Producer Program, should aid greatly in understanding what factors affect the quality and long term performance of HMA.

ROUNDING

The Certified HMA Producer Program designates specific quantities of material to be sampled, material test values, and test equipment calibration measurements. As such it is imperative that a standard method for rounding values be established. The method required by the QC/QA specifications is the "5" up procedure. There are two rules for rounding numbers:

1. When the first digit discarded is less than 5, the last digit retained should not be changed.

Examples:

2.4 becomes 2
2.43 becomes 2.4
2.434 becomes 2.43
2.4341 becomes 2.434

2. When the first digit discarded is 5 or greater, the last digit retained should be increased by one unit.

Examples:

2.6 becomes 3
 2.56 becomes 2.6
 2.416 becomes 2.42
 2.4157 becomes 2.416

The Certified HMA Producer Program and QC/QA specifications require that test values and calculations be determined to the nearest decimal place as indicated in Figure 1-1.

Property	Nearest Whole Unit (0)	First Decimal Place (0.0)	Second Decimal Place (0.00)	Third Decimal Place (0.000)
CAA	X			
Density	X			
FAA	X			
Sand Equivalency	X			
Tensile Strength	X			
VFA	X			
Binder Content		X		
Control Limits		X		
Dust/Effective Binder		X		
Five-Point Moving Avg.		X		
Gradation		X		
Target Mean		X		
VMA		X		
Air Voids		X		
Drain Down			X	
HMA Moisture			X	
Bulk Specific Gravity				X
Max. Specific Gravity				X

Figure 1-1

VOLUMETRICS

Hot mix asphalt properties are most affected by volume not weight; however production and testing of HMA is by weight. Specific gravity is the means to convert from units of weight to volume. The definition of specific gravity and equations relating specific gravity to density and volume are as follows:

Specific Gravity -- the ratio of the weight of a given volume of an object to the weight of an equal volume of water at 77°F.

Density

$$D = G \times 62.416$$

where:

D = Density in lb/ft³

G = Specific Gravity

62.416 = Density of Water in lb/ft³ at 77°F

Volume

$$V = \frac{W}{G \times 62.416}$$

where:

V = Volume in ft³

W = Weight in lb

G = Specific Gravity

62.416 = Density of Water in lb/ft³ at 77°F